This report was funded by the Bonneville Power Administration (BPA), U.S. Department of Energy, as part of BPA's program to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities on the Columbia River and its tributaries. The views in this report are the author's and do not necessarily represent the views of BPA.

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ANADROMOUS FISH HABITAT ENHANCEMENT FOR THE MIDDLE FORK AND UPPER SALMON RIVER

ANNUAL REPORT - 1988

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Contract Number DE-AI79-84BP17579
Project Number 84-24

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ABSTRACT

The wild and natural salmon and steelhead populations in the Middle Fork and Upper Salmon River are at a critical low. Habitat enhancement through decreasing sediment loads, increasing vegetative cover, removing passage barriers, and providing habitat diversity is imperative to the survival of these specially adapted fish, until passage problems over the Columbia River dams are solved.

Personnel from the Boise and Sawtooth National Forests completed all construction work planned for 1988. In Bear Valley, 1573 feet of juniper revetment was constructed at eleven sites, cattle were excluded from 1291 feet of streambanks to prevent bank breakdown, and a small ephemeral gully was filled with juniper trees.

Work in the Upper Salmon Drainage consisted of constructing nine rock sills/weirs, two rock deflectors, placing riprap along forty feet of streambank, construction of 2.1 miles of fence on private lands, and opening up the original Valley Creek channel to provide spring chinook passage to the upper watershed.

A detailed stream survey of anadromous fish habitat covering 72.0 miles of streams in the Middle Fork Sub-basin was completed.

INTRODUCTION

As a result of The Pacific Northwest Electric Power Planning and Conservation Act of 1980, the BPA was given the authority to use its legal and financial resources to protect, mitigate, and enhance fish and wildlife effected by the development of hydroelectric projects of the Columbia River and its tributaries. The BPA, therefore, funded the Middle Fork and Upper Salmon River Enhancement project.

This project is being implemented using the Riddle Fork and Upper Salmon River Habitat Improvement Implementation Plan FY 1988-1992 (Andrews and Everson 1988) which was developed by the Forest Service in consultation with the Idaho Department of Fish and Game, and the Shoshone-Bannock Tribes. The project is being conducted in two phases: Phase I, Inventory and Design: and Phase II, Project Implementation.

Goal and Objectives

The goal of this project is to increase the quality and quantity of spring and summer chinook salmon and summer steelhead trout with an emphasis on increasing the survival of wild and natural stocks. This goal will be achieved by protecting and improving the habitat of the stocks indigenous to the Middle Fork Salmon River and natural stocks in the upper Salmon River. The habitat project will help increase fish production over current levels,

By increasing the quality and quantity of anadromous fish habitat, the survival and production of salmon and steelhead is bettered. Continued survival and increased production of existing stocks is imperative until passage of migrating smolts over the Columbia River dams is improved,

The project objectives are to increase spring and summer chinook and steelheed production by reducing sediment loading, improving riparian vegetation, eliminating migration barriers, and providing habitat diversity. Attainment of these objectives should result in increased juvenile rearing densities and smolt production of anadromous fish.

Meeting the above goal and objectives will provide off-site mitigation under the mandate of the Pacific Northwest Electric Power Planning and Conservation Act of 1980.

The objectives will be addressed es follows:

1. Reduce sediment loading

Stream sediment loads, severely above natural levels, are detrimental to all life stages of anadromous fish. Sediment clogs and covers gravels, decreasing spawning success. It smothers incubating eggs and fry, reduces aquatic insects which provide most of the food for rearing juvenile fish, and eliminates the spaces between rocks and fills in pools which are important rearing habitats for juvenile salmonids. Sediment in excess of natural levels aids in the deletion of dissolved oxygen and the increase of water temperatures. The well-being of developing salmonids depends'upon certain dissolved oxygen and water temperature ranges. Fluctuations from these ranges could reduce survival.

The reduction of sediment loading will be met through minimizing the sediment from upland sources by stabilizing stream banks. A measurable objective will be the reduction of silt laden gravel to less than 30 percent surface sand and embeddedness. The IDFG ocular transect method (Torquemede and Pletts 1988) will be used to estimate reductions.

2. Provide optimum riparian vegetation

Good riparian vegetation is necessary for optimum fish habitat, Overhanging plants provide shade, hiding cover, and food, essential to the survival of juvenile and adult salmonids alike.

Degraded areas will be restored by planting large clumps, cuttings, seeds, and rooted stock native to the aree that is predicted to do well in a given community type. The success of this revegetation effort depends upon the effort towards improved grazing management practices. Providing optimum riparian vegetation will also contribute to meeting the firstobjective.

3. Eliminate passage barriers

Many miles of stream suitable for adult spawning and juvenile rearing are out of reach because of passage barriers and obstructions. Eliminating passage barriers will provide passage for both adult and juvenile anadromous fish migration to more fully utilize suitable spawning and rearing habitat. Possible methods of correcting passage problems include: blasting of obstructions, cleaning debris blockages, constructing side channels around barriers, providing instream flows, and building rock sills and fish ladders over barriers.

4. Increase habitat diversity

Habitat diversity (a variety of habitat types) is as necessary to- optimum fish production as edge is to big game production. Habitat diversity in the form of additional cover and complexity will be provided by meeting riparian vegetation restoration objectives and diversifying habitat types while treating unstable streambanks.

The habitat units identified in habitat inventories are riffles, pools, and glides. To attain habitat diversity, there should be a variance in these habitat types in a certain stretch of stream. Generally, riffles are used for chinook and steelhead spawning and very early rearing and glides and pools are used for rearing. Providing e balanced number of all types of habitat within a stream creates a better opportunity for both spawning and rearing.

Background

Phase I, initiated in FY 1984, has consisted of habitat inventories, fisheries habitat problem identification, and recommendations for future project implementation (See FY 1986 84-24 contract and work statement for Phase I beckground and specifics). This phase was essentially completed with the publishing of the Inventory Reports for the Middle Fork and Upper Salmon Rivers in February 1987 (OEA Research 1987a and OEA Research. 1987a) which were used in the preparation of the implementation plan. The bulk of Phase II, Project Implementation, is scheduled to be completed by 1991.

Phase II includes implementation of habitat improvement, enhancement, and passage restoration projects on specific reaches of those streams identified in Phase I. Improvement methods to be employed in affecting habitat restoration include structural (bank and instream structures, fencing, fishways, erosion control, etc.) and nonstructural (riparian revegetetion, instream flows, land management changes, etc.) modifications. Implementation will be consistent with actions identified in the Northwest Power Council's Columbia River Fish and Wildlife Program, Section 703 (c) (1) and the Appendix A Table (Planning Inventory of Projects for the Salmon River Subbasin: Marsh Creek, Elk Creek, Bear Valley Creek, Valley Creek, and Upper Salmon River). These areas include portions of the Boise, Challis, Salmon, and Sawtooth National Forests,

Agency and Tribal Coordination

This project is being implemented by the Forest Service in cooperation with the Shoshone-Bannock Tribes and the Idaho Department of Fish and Game (IDFG). The Middle Fork and Upper Salmon Subbasins enhancement project continues to be coordinated throughout the design, implementation, and monitoring phases. Copies of the Middle Fork and Upper Salmon River Habitat Improvement Implementation Plan FY 1988-1992, annual reports and work statements were submitted to the respective agencies for comment.

NEPA Compliance

NEPA documents for the following sub-projects were prepared by Bonneville Power Administration (BPA) from information supplied by the Forests. The Forests were responsible for scoping and alternative preparations.

Study Area.

The Salmon River Subbasin is the largest subbasin in the Columbia River, For the implementation plan, the Salmon River Subbasin is divided into three general areas: The Lower Salmon River below Riggins, the Middle Salmon River between Riggins and the mouth of the Middle Fork Salmon River, and the Upper Salmon River above the mouth of the Middle Fork Salmon River (figure 1). The implementation plan does not address anadromous fish habitat improvement in the Camas Creek, Panther Creek, Yankee Fork, East Fork Salmon River, or Lemhl River drainages which have or will have their own individual work statements.

The project area is looated in Central Idaho in what is commonly known as the Idaho Batholith. The geology of the area primarily consists of underlying cretaceous granitic rock with tertiary intrusive and extrusive igneous rocks making up the remaining bedrock.

Average annual precipitation ranges from 10 inches at Stanley to 48 inches in Bear Valley with higher elevations receiving more precipitation mainly in the form of snow. Stream hydrology is dominated by high spring runoff from snowmelt in the mountains.

Fishery Resource

The 1985-1990 Idaho Anadromous Fisheries Management Plan (Anonymous 1985) states "The Salmon River is the most important tributary in the Snake and Columbia River drainages for anedromous fish production. The Middle Fork is the largest tributary of the Salmon River and is the most important producer of anadromous fish. Both chinook and steelhead indigenous to the Middle Fork are unique. The chinook population includes a high proportion of large, 5 year-old fish. No hatchery produced chinook have ever been stocked into the Middle Fork, leaving the indigenous gene pool intact. Both the chinook and steelhead of the Middle Fork are uniquely adapted to the habitat conditions and long migrations distances. Preservation of the indigenous gene pools is a high priority."

Marsh and Bear Valley Creeks combine to form the Middle Fork Salmon River in T. 13 N, R. 10 E. (Figure 2). Presently, the spring chinook escapements in the Middle Fork Salmon River drainage are at an extremely low level. Without help in instream sediment reduction and habitat improvement, significant portions of these runs won't be able to continue as viable wild populations. The IDFG plans to manage the Middle Fork Salmon River drainage for strictly natural production of wild indigenous stocks of salmon and steelhead.

The Upper Salmon River is noted for its value as an anadromous sport fishery. Both the main river and its tributaries are important areas for natural anadromous salmonid production. Habitat improvement work conducted in the Upper Salmon River drainage provides additional recreational opportunity for sport fishermen by increasing stream productivity and carrying capacity for anadromous fish. Since many of the fish produced in the Upper Salmon River are harvested downstream, offsite commercial and sport fisheries are benefited as well.

The upper Salmon River drainage above Sawtooth National Fish Hatchery is expected to be heavily seeded within several years with adult spring chinook from the hatchery. Other streams in the upper Salmon River drainage are and will be extensively outplanted with eggs, fry, and fingerling as well as adult spring chinook and summer steelhead. It is the intent of this project to restore and enhance the spawning and rearing habitat in the upper Salmon River Basin in a cost effective manner which will aid in the success of this extensive seeding program (Figures 3 and 4).

Current potential smolt production capacity of the project portion of the Middle Fork and Upper Salmon Rivers is estimated at 5,206,000 spring and summer chinook and 614,000 summer steelhead for a total of 5,820,000 smolts (Tables 1-2 and Figures 5-6). The estimated annual increase in potential smolt production as the result of this project is 669,000 spring and summer chinook and 75,000 summer steelhead. Fish population responses will be monitored and documented by the Idaho Department of Fish and Game as a part of BPA Project 83-7.

ACCOMPLI-

The accomplishments for 1988 are listed by sub-project as follows:

Sub-projects Ia & b - Bear Valley Creek and Elk Creek.
During June 1988, the Boise National Forest obtained nearly 2,000 cut juniper trees 8 to 15 feet long from Jordan Creek in the Bureau of Land Management's Owyhee Resource Area. These trees were used on the Lowman Ranger District's 1988 Juniper Project in the Bear Valley drainage.

The objective of the project was to stabilize eroding stream banks by preventing further erosion and trapping silt and debris to build up the banks. Once sediment has been trapped, willows and grasses can colonize the area.

Two juniper riprap construction techniques were used. The first technique completely covered the bank with junipers. Steel fence posts were driven in the stream bank approximately 15 to 20 feet apart. The top of the posts were just below the edge of the upper bank. A wire was tightly stretched between the posts near the ground with a fence stretcher. The junipers were laid either perpendicular or parallel to the bank. Once the trees were in place they were wired down. The upstream end of the revetment was thoroughly anchored with Duckbill anchors. Several anchors were also placed at intervals along the revetment. Some trees were also added to the revetment at the toe of the cut bank providing additional bank support and cover for fish.

The second technique used a single row of overlapping trees (butt end upstream) laid parallel to the stream at the toe of the cut bank and tied together. Duckbill anchors were driven in the stream bed where the trees overlapped and at each end of the revetment. If a single row of trees proves to be an effective method of abating the cutting of the stream banks, this method should be used in most cases. With the single row of trees (the larger the better), very few anchors are required and construction of the revetment proceeds quickly. The single row of trees is easily constructed by one person.

Use of the Duckbill anchors greatly enhanced the stability of the revetments. The anchors are an effective and easy way of anchoring juniper trees in sand and gravel bottom streams. They may not be suitable in large rock or bedrock due to the difficulty of driving the anchors.

To aid bank recovery at several sites, cattle were excluded from the stream with a 30-inch high, one-rail fence or a single row of juniper trees. The fence was built 6 to 12 feet back from the edge of the cut bank and consisted of an untreated lodgepole pine rail spiked on top of treated posts. A different technique involved wiring a single row of overlapped juniper trees to the upper bank at the edge of a cut bank with the butt end facing upstream. This structure was built to determine if juniper trees could be used to prevent cattle from walking along the edge of the streambank and breaking it down.

Approximately 1900 trees were used in constructing the revetments (ELK 1, 3, 3a; BVC 1, lx, la, lb, 4, 5; Experimental site 1) and cattle deflector along Elk and Bear Valley Creeks.

Elk Creek - Portland Mine Bank Stabilization ELK #1

Junipers were placed perpendicular along 510 feet of cut-bank. A fence was built 10 to 12 feet back from the edge of the cut bank to exclude cattle from the area.

Elk Creek - Cook Creek Fence Deflection ELK #3

Junipers were laid flat along 80 feet of cut-bank. Junipers covered the entire bank in the downstream half of Elk # 3 and were placed in single row along the bottom of the bank In the upstream half of Elk #3. A fence was built 10 to 12 feet back from the edge of the cut bank to exclude cattle from the area.

Elk Creek - Cook Creek ELK #3a

Located a short distance upstream from Elk #3. Junipers were laid flat along 60 feet of cut-bank. Construction of this revetment was similar to the upstream half of ELK #3. No fence was built to exclude cattle.

Bear Valley Creek - Transfer Cabin Stream Crossing BVC #1

A fence was built 6 feet back from the edge of the cut bank to exclude cattle from the area. The lodgepole pine fence was constructed along 150 feet of streambank. A 15 foot wide opening was left to allow livestock and big game animals to cross the stream on a gravel bar. Junipers were placed parallel to the stream within the fence.

Bear Valley Creek - Transfer Cabin Stream Crossing BVC #1x

A single row of junipers were laid flat along 40 feet of the stream adjacent to the downstream end of BVC #1. No fence was built to exclude cattle.

Bear Valley Creek - Transfer Cabin Stream Crossing BVC #1a.

Located downstream from BVC #1. Junipers were laid flat along 55 feet of cut-bank. Construction of this revetment was similar to the upstream half of ELK #3. No fence was built to exclude cattle.

Bear Valley Creek - Transfer Cabin Stream Crossing BVC lb.

Located downstream from BVC #1. Junipers were laid flat along 165 feet of cut-bank. Construction of this revetment was similar to BVC #la. No fence was built to exclude cattle.

Bear Valley Creek - Cache Creek BVC #4

Junipers were laid flat along 264 feet of cut-bank. A fence was built 10 to 12 feet back from the edge of the cut bank to exclude cattle from the area.

Bear Valley Creek - Cache Creek BVC #5

Junipers were placed perpendicular along 192 feet of cut-bank. A fence was built 10 to 12 feet back from the edge of the cut bank to exclude cattle from the area.

Bear Valley Creek - Experimental Site 1

Located 0.3 miles north of MP 29 on road 582. A single row of junipers wase laid flat along 72 of bank at, or just below the water level.

Bear Valley Creek - Experimental Site 2

Located 0.4 mile south of marker'29 on road 582. A single row of junipers were laid flat at the top of the cut bank for a distance of 110 feet. This structure was built to determine if juniper trees could be used to prevent cattle from walking along the top of the cut bank.

Bear Valley Creek - Ephemeral Gully Site

Juniper trees were used to line a 40 foot long gully near the Transfer Cabin Stream Crossing.

Sub-Project Ic - Marsh Creek Drainage.

No accomplishments in the Marsh Creek drainage were made during the 1989 field season.

Sub-project IIa - Pole Creek Project.

A riparian easement allowing fence construction and maintenance was obtained from the Salmon Falls Sheep Company. Constuction began on 2.1 miles of fence on the private land. The fence was 75 percent completed before snow and freezing weather forced the contractor to delay construction until spring of 1989.

Sub-Project IIb - Valley Creek.

A memorandum of understanding was established with the Valley Creek Diversion #6 (vc-6) water users. Constructed flow control consisting of a large rock deflector was constructed to split the stream flow at the vc-6 diversion which previously left the channel of Valley Creek dry. Two rock weir and sill structures were constructed to assure proper flow was in each channel. These flow control structures now allow salmon access to the upper nine miles of Valley Creek. Spring chinook salmon were observed spawning in Valley Creek above the diversion by IDFG surveyors during late August.

Sub-Project IIIb - Upper Salmon River and Tributaries.
A riparian easement allowing erosion control construction and maintenance was obtained from the Idaho Rocky Mountain, Massey, and Rember Ranches. Work on the the upper Salmon River consisted of constructing six rock weirs and one rock deflector.

PROJECT COSTS

Total costs incurred by the BPA on this project as of March 31,1988 were $286,965.49. Incurred and anticipated expenses from April, 1988 to February 23, 1989 are estimated to total $356,000 (table 3). ?

PROPOSED ENHANCEMENT ACTIVITIES - 1989

The tasks listed below are planned for the 1989-91 field seasons. A project implementation scheduling chart is shown in figure 7. A summary of the project budgets for FY 1989-1992 is shown in table 4.

Bear Valley Creek tasks are as follows:

Taskl: Continue the final design for the Bear Valley drainage including proposed bank stabilization, channel rehabilitation, riparian revegetation, protective fencing, and sediment traps.

Task 2: Construct two upstream **pointing rock** deflectors **at the high cut** bank sediment source in Bear Valley Creek one half mile downstream form Bear Valley Campground.

Elk Creek tasks are as follows:

Task 1: Complete the final design for the total Elk Creek Drainage including proposed **bank** stabilization, channel rehabilitation, riparian revegetation, protective fencing, **and** sediment traps.

Task 2: Continue the sediment source and bank stabilization project on 5.1 miles of Bearskin Creek in OEA reaches 1, and 2 and 2.4 miles of sediment **carrying tributaries.** Twenty rock check dams will be constructed in **Bearkin** tributaries. Sixteen **bank** erosion sites will be treated with an erosion fabric **and** logs, and one sediment trap will be constructed on lower Bearskin Meadows.

Task **3:** Complete the sediment source and bank stabilization project on 5.7 miles **of** Elk Creek on OEA reach 1. The large oxbow supplying most of the sediment to lower Elk Creek will be bypassed and turned into a 500 feet long sediment trap.

Concurrent with the above tasks, the Forest Service is revising the Bear Valley and Elk Creek Allotment Management Plans. These revisions are expected to be completed by **1991.**

Marsh Creek tasks are as follows:

Task **1:** Complete the final design for the Marsh Creek drainage. The Sawtooth National Forest is preparing an EIS that analyzes alternatives maintaining cattle grazing in OEA reaches 4 and **5** of Marsh Creek (30 percent streamside use) or eliminating cattle **grazing** from the entire Marsh Creek drainage.

Pole Creek tasks are as follows:

Task 1: Complete the final design for the Pole Creek drainage including **proposed bank stabilization,** channel **rehabilitation, riparian** revegetation, **and** protective fencing. This will include developing a plan in OEA reach 3 to reduce erosion where the stream abandoned the old channel and carved a new one.

Task 2: Complete the fence on 2 miles of lower Pole Creek before the **graz**ing season (fence is **75** percent complete).

Valley Creek tasks are as follows:

Task 1: Complete the final design for 27.9 miles of the Valley Creek drainage including proposed fencing, passage improvements, and riparian revegetation.

Task 2: Finish the Valley Creek Diversion-6 return flow channel by installing rock energy dissipaters to control erosion install a concrete, steel, and/or wood **headgate** at the upper end of the project to control high flows as well as adequately supply stream flow to the reopened channel. This will assure adult anadromous fish passage to the upper Valley Creek drainage, prevent sediment problems, and increase rearing production.

Task 3: Treatment of the Elk Meadows site will be delayed until results of the riparian fencing installed in 1987 are known. If the site is still an erosion problem, erosion control structures will be installed below the present two structures which will be rebuilt.

An additional task jointly funded by the Forest Service and IDFG is the installation of a six inch diameter, 1,300 foot long bypass pipe from the downstream migrant screen back to Valley Creek.

Upper Salmon River tasks are as follows:

Task 1: Begin the final design for 104.7 miles of the the Upper Salmon River, This includes bank stabilization, channel rehabilitation, riparian revegetation, and protective fencing on private lands.

Task2: Continue the final design for 4.0 miles of Beaver Creek, including negotiating a memorandum of understanding or easement with the private landowner concerning access to the project site, stream flow, 4,000 feet of bank stabilization, 1,500 feet of channel rehabilitation, 1,000 feet of riparian revegetation, and one mile of protective fencing. Areas where braiding has occurs will be treated to provide one channel for better fish passage and to reduce sediment in Beaver Creek, in the Salmon River, and at the Sawtooth National Fish Hatchery downstream.

Task 3: Within the Sawtooth National Recreation Area, drop structures have been designed to control erosion at the Idaho Rocky Mountain Ranch and Massey sites along the upper Salmon River by GEOMAX (Dr. D. Riechmuth). These structures will complement structures installed in 1988 at Idaho Rocky Mountain Ranch, Rember Ranch, and National Forest Land above Rember Ranch. In addition to the the drop structures on private lands, five drop structures are needed on National Forest lands (Decker Flat Diversion and adjacent to the highway below the Rember Ranch site). These structures should prevent future erosion problems in the area while increasing the quality and quantity of spring chinook and summer steelhead habitat.

Task 4: Continue the final design for Basin, Thompson, Squaw, and Morgan Creeks. Finish main stem Upper Salmon River riparian revegetation. Construct structures to control erosion and stabilize sand and fines in the Basin, Thompson, Squaw, and Morgan Creeks drainages. Specific areas of treatment are:

Basin Creek. Control two headcuts on Kelly Creek. Control erosion along 800 feet of eroding tailing piles at the old abandoned uranium mine in East Basin Creek, Treat eroding banks in Little Basin Creek.

Thompson Creek. Control erosion along four miles Thompson Creek below Pat Hughes Creek and along 650 feet of eroding banks at the abandoned Scheelite Jim Mine above Buckskin Creek.

Squaw Creek. Control erosion along the natural eroding bare hills in Cinnabar Creek.

Morgan Creek. Improve chinook salmon passage at the ten foot cascading falls on Morgan Creek four miles above the mouth. Construct fence and control erosion on private lands in Morgan Creek.

MONITORING AND EVALUATION

Physical monitoring of the projects is being accomplished by the Forest Service in consultation with the Idaho Department of Fish end Game and the Shoshone-Bannock Tribes. Project monitoring will be accomplished by an annual visual inspection of the project area after spring runoff to determine maintenance needs.

Two types of surveys will be used to evaluate the quality and quanity of anadromous fish habitat, These surveys consist of a comprehensive physical habitat survey prior to and following implementation and the IDFQ ocular embeddedness transect. These surveys enable us to document changes in anadromous fish habitat production capability and measure the total amount of physical habitat available to anadromous fish. All 1988 projects were surveyed before implementation.

The physical habitat survey is a combination of stream reach inventories, channel stability evaluations, and fishery habitat appraisals in anadromous and potentially anadromous streams. Each stream was inventoried during the low flow period to collect data on biological and hydrological conditions. Survey methods were derived from previous experience and procedures developed by the Forest Service in Regions 1 (Pfankuck 1978) and 4 (Anonymous 1988). These methods have proved to be reliable and effective for inventorying habitat conditions for northwestsalmonids.

The survey method relied on both measurements and observations, requiring a minimum of equipment. The equipment included a thermometerfor water and air temperature determinations, a compass for stream orientation, a hand level and level rod for gradient and slope gauging, a densiometer for cover quantification, a five-foot pole graduated in six inch lengths for depth, length, and width measurements, and a camera for documentation. These instruments are readily available as basic tools of a biologist. The parameters that could not be quantitatively measured, such as bank stability and stream morphology, were rated using a set of evaluation criteria.

Before field work began, streams were divided into reaches based on OEA (OEA Research 1987a and 1987b) and Environmental Protection Agency (1986) reaches. In the field reaches were divided further into strata which were delineated by significant changes in stream characteristics such as bottom composition, gradient and flow. Within each reach, each individual habitat unit (pool, riffle and glide) was measured, providing a complete and accurate account of the quantity and quality of physical habitat available to anadromous salmonids. The biological and physical properties of each reach were recorded to provide the following data:

1. Individual Habitat Units:

Length, average stream width, surface area, average and maximum water depth, pool quality (Platts et al. 1983), surface water velocity, substrate composition (visual estimate), and spawning gravel quality and quantity. .

2. Stream Reaches:

Gradient, stream flow, high flow width, bsnkful depth, stream stage, stream type (Rosgen 1985), pool/riffle ratio, sinuosity ratio, percent undercut banks, percent substrate embeddedness, bank soil type, water and air temperatures, barriers to migration, amount and type of aquatic vegetation, amount of overhanging vegetation, fish species and numbers observed, and channel stability. Channel stability was evaluated by estimating the following: upper bank land form, slope, mass wasting hazard, debris jam potential, vegetation bank protection, lower bank channel capacity, bank rock content, flow deflectors and obstructions, bank cutting and point-bar deposition, channel bottom rock angularity, brightness of bottom, particle packing, percent stable material and size distribution, scour and deposition; and the amount of clinging vegetation.

3. Riparian Environment:

Typical width of the riparian zone, the type and percentage of vegetation in the riparian zone, the size of the vegetation, and the plant community composition by dominance. Riparian environment was evaluated only on those streams not surveyed by OEA Research in 1985.

Descriptive statistics (mean, standard error, percent relative abundance) were calculated by strata, OEA and EPA reach, stream, and drainage. Future analyses may include comparisons with past years data, comparisons between streams, and comparisons between drainages.

Photographs were used extensively to document the conditions in each reach. Photos were taken of major features, such as barriers, pollution indicators, major substrate problems, cattle use indicators, beaver use indicators, and past logging activities.

In addition to the physical habitat surveys, Forest Service personnel measured instream sediments using IDFQ ocular transects (Torquemada and Platte 1988). Permanent transect sections were established by the IDFG in several streams in the Middle Fork Salmon River and Upper Salmon River drainages. These transect sections consist of a minimum of ten cross sectional transects at intervals upstream from a fixed starting point. Additional transect sections were established in Bear Valley Creek, Bearskin Creek, and Elk Creek to further document changes in physical habitat as a result of Forest Service projects. After recording the width of the stream at each transect we measured the depth, habitat type (pool, run, pocketwater, riffle, or backwater), percent substrate, percent embedded by fines, and substrate score (Torquemada and Platte 1988) at 1/4, 1/2, and 3/4 intervals. Descriptive statistics (mean, standard error, percent relative abundance) were calculated by section, OEA reach, and stream. Statistical comparisons between IDFQ and USFS data are planned for the future.

Fish population evaluation data collected by IDFQ will be combined with the physical habitat monitoring data collected by the Forest Service to verify the smolt estimates and to produce a comprehensive annual report for all the projects. This monitoring and evaluation effort is designed to ensure that the direct habitat improvements scheduled for this project are accomplished to the stated goal and objectives.

Evaluation activities planned for 1989 include: 1) completing the comprehensive physical survey for the 84-24 project area, including surveys begun during 1988 as well as Basin, Beaver, Flat, Morgan, Squaw, Stanley, Thatcher, and Thompson Creeks: and 2) resurvey of Bearskin Creek, Elk Creek (from above the mouth of Bearskin Creek downstream to the mouth of Elk Creek), and Bear Valley Creek (above and below the mouth of Elk Creek) to document any physical changes which occurred during spring runoff.

During the summer and early fall of 1988, a total of 72 miles of project streams were evaluated in the Middle Fork Salmon River (38.1 miles), South Fork Salmon River (9.0 miles), and Upper Salmon River (24.9 miles) Subbasins (Table 5). In addition, 91 ocular transect sections were surveyed in the Middle Fork Salmon River (55 sections) and Upper Salmon River (36 sections) Subbasins (Table 5). Those reaches evaluated on Bearskin and Elk Creeks had been evaluated previously in 1987 and were surveyed again for comparative purposes.

<u>IDFQ ocular transects</u>

Pools and backwaters were the most abundant type of habitat in those streams in the Middle Fork Salmon River drainage with the exception of Bear Valley Creek (Figure 8). Runs and riffles were most abundant in the Upper Salmon River drainage. Other habitat types were present in varying amounts. Side channels of Bear Valley Creek and Elk Creek were made up almost entirely of pool and backwater habitat. These side channels are high flow channels and there was little, if any, flow when we surveyed them. Pocketwater type habitat was not abundant in any of the streams surveyed.

Mean depths were similar between all the streams, but most streams in the Middle Fork Salmon River drainage were slightly deeper than Upper Salmon River drainage streams. This may be a reflection on the high amount of pool habitat sampled in the Middle Fork Salmon River drainage.

Substrate composition varied between streams. It was evident that streams in Bear Valley (Bearskin, Elk, and Bear Valley Creeks) had higher levels of sand than the other streams surveyed (Figure 9). Smaller substrate sizes (sand, gravel, and rubble) were dominant in all the streams. Substrate embeddedness reflected the higher sand levels found in Bear Valley. Bear Valley and Elk Creek side channels had the highest embeddedness and sand levels followed by Bearskin, Elk, and Bear Valley Creeks.

Substrate score, a rating system which takes into account the dominant and subdominant substrate sizes plus the percent embeddedness, also mirrored substrate composition and embeddedness values (Figure 10). Generally, a higher score (maximum is 15) means you have larger substrate and lower embeddedness values. The streams with the highest median scores were those in the Upper Salmon River drainage and Knapp Creek which had the least amount of sand and lowest embeddedness values;

PROJECT MAINTENANCE

Maintenance of the project over time is essential to provide the long term increases in anadromous fish production anticipated. The project has been and will continue to be designed to minimize maintenance. No maintenance was needed in 1988. The fence sites will need annual maintenance to insure they continue to be cattle tight. In the future, improved grazing management programs will be encouraged to remove the need for fences.

LITERATURE CITED

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Appendix A: Figures 1 to 10

Figure I. Location of Project Area.

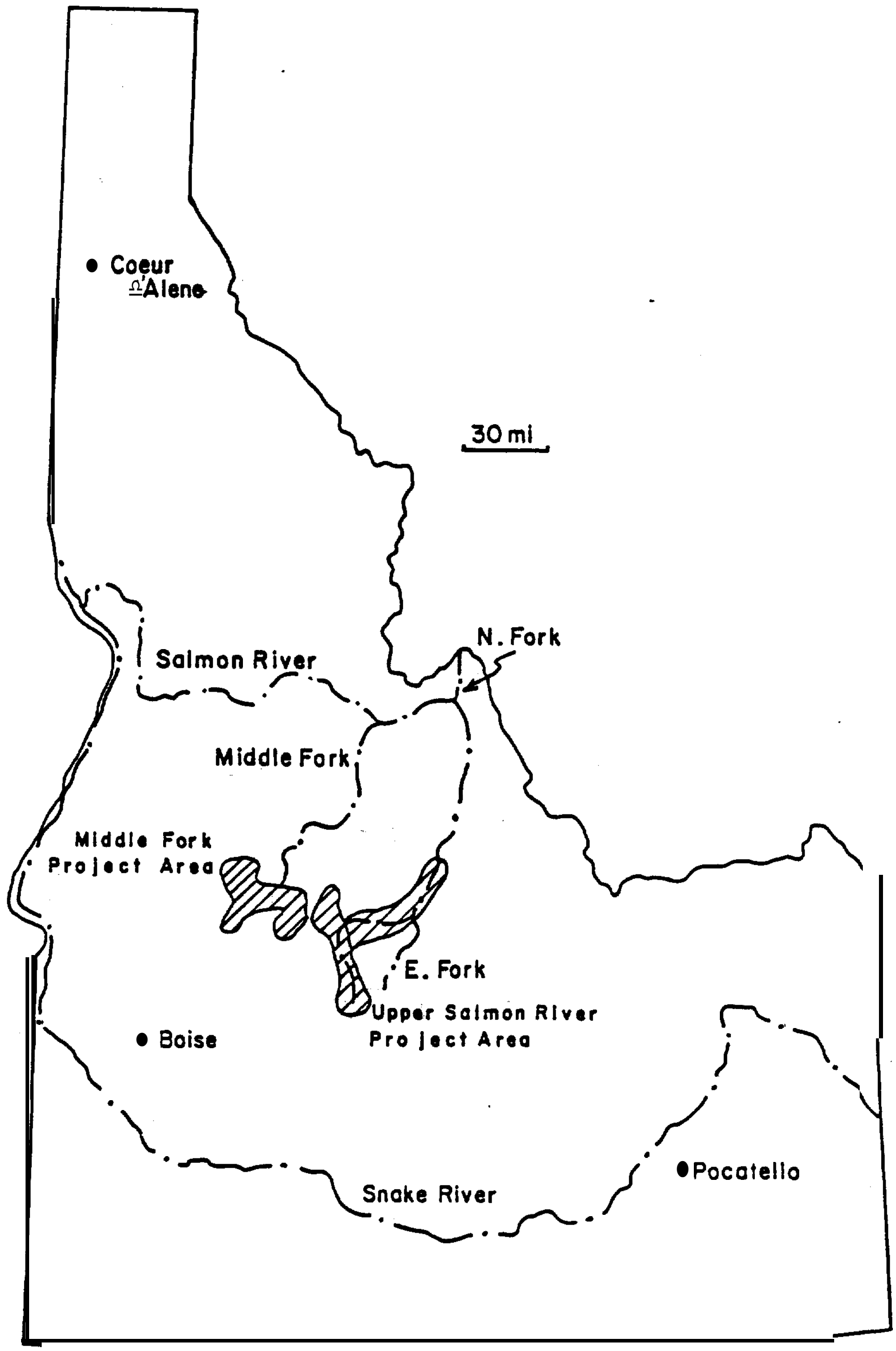


Figure 2. The Middle Fork Salmon River (Boise and Challis National Forests).

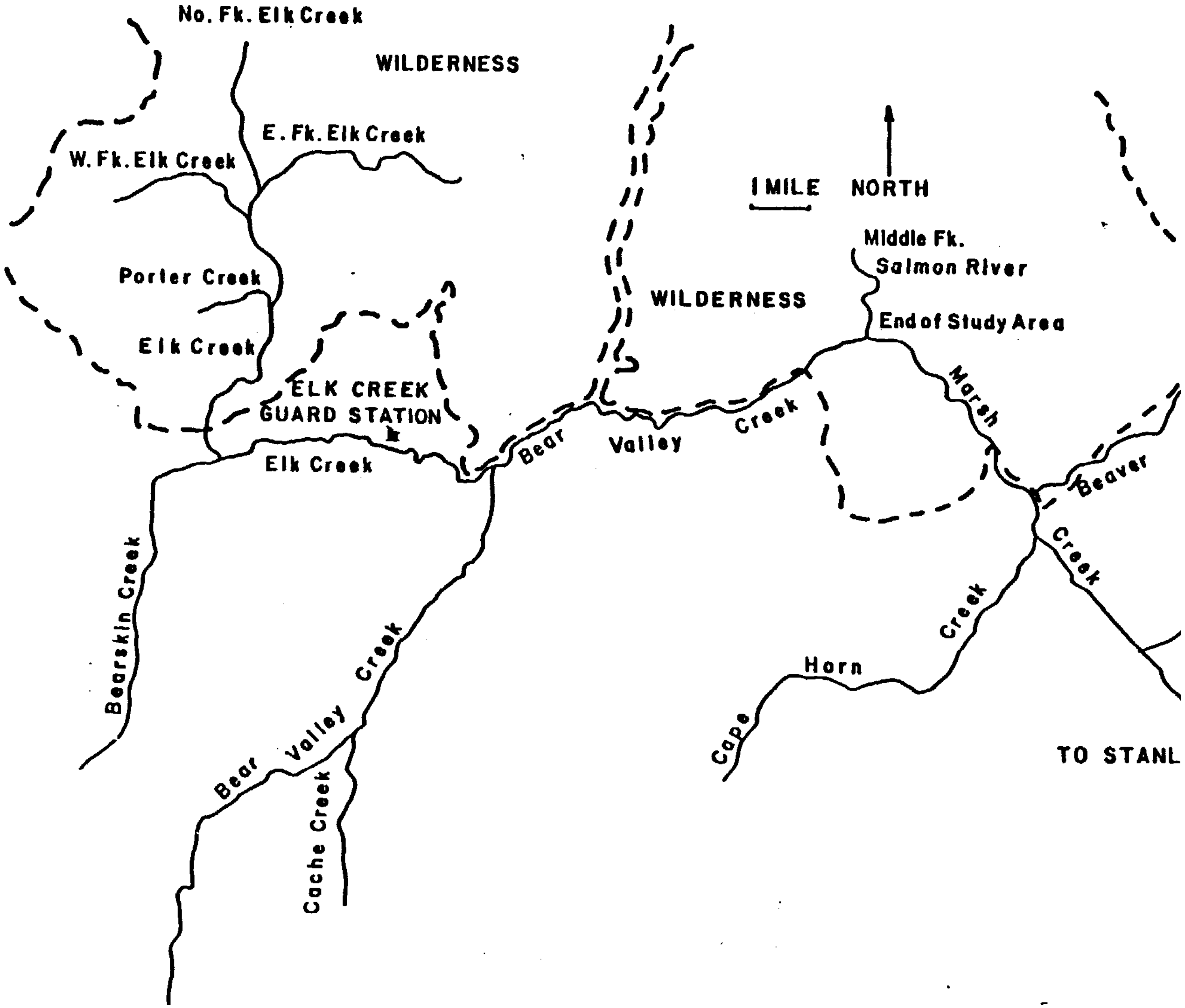


Figure 3. Upper portion of the Salmon River and its tributaries. (Sawtooth National Recreation Area).

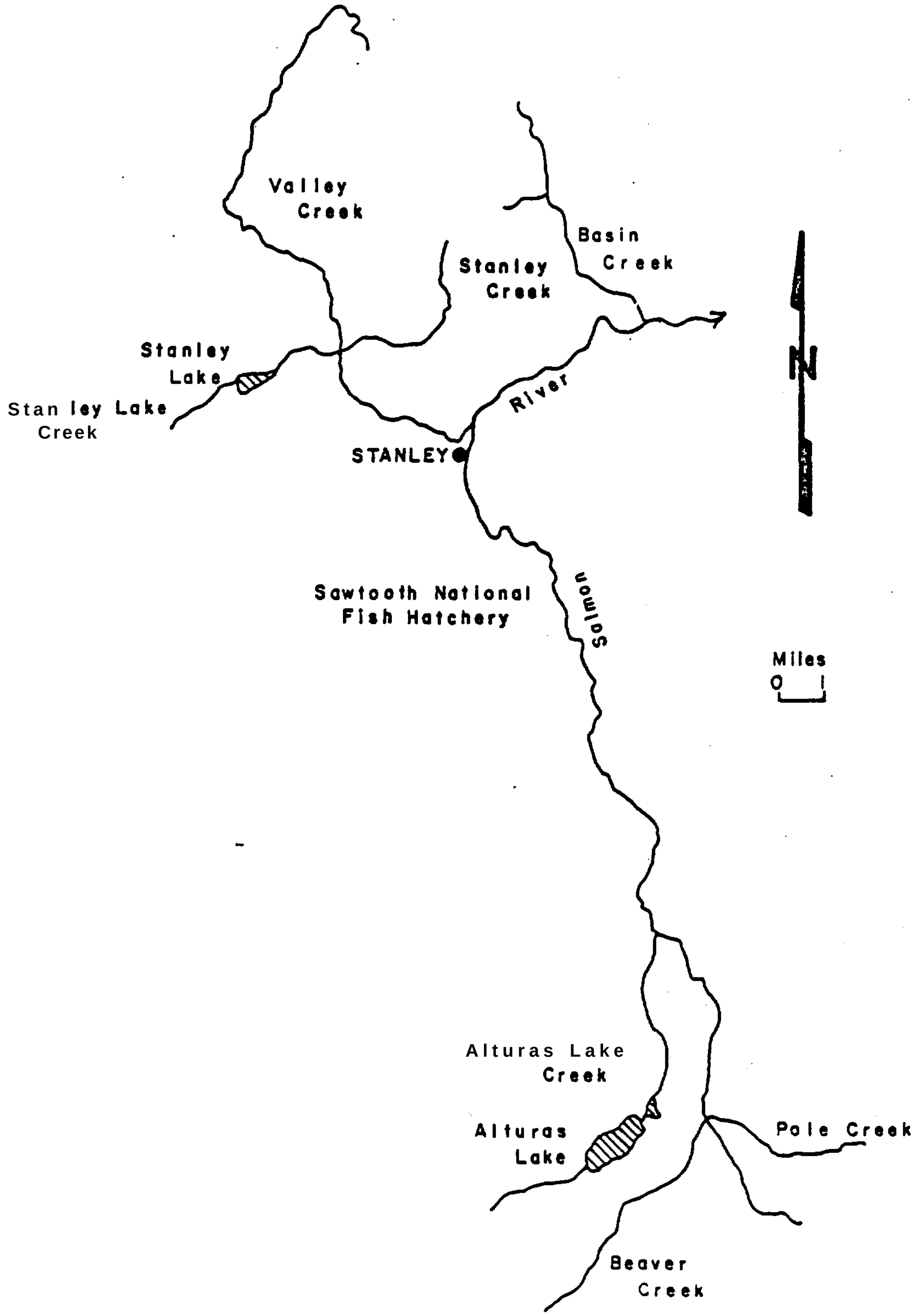
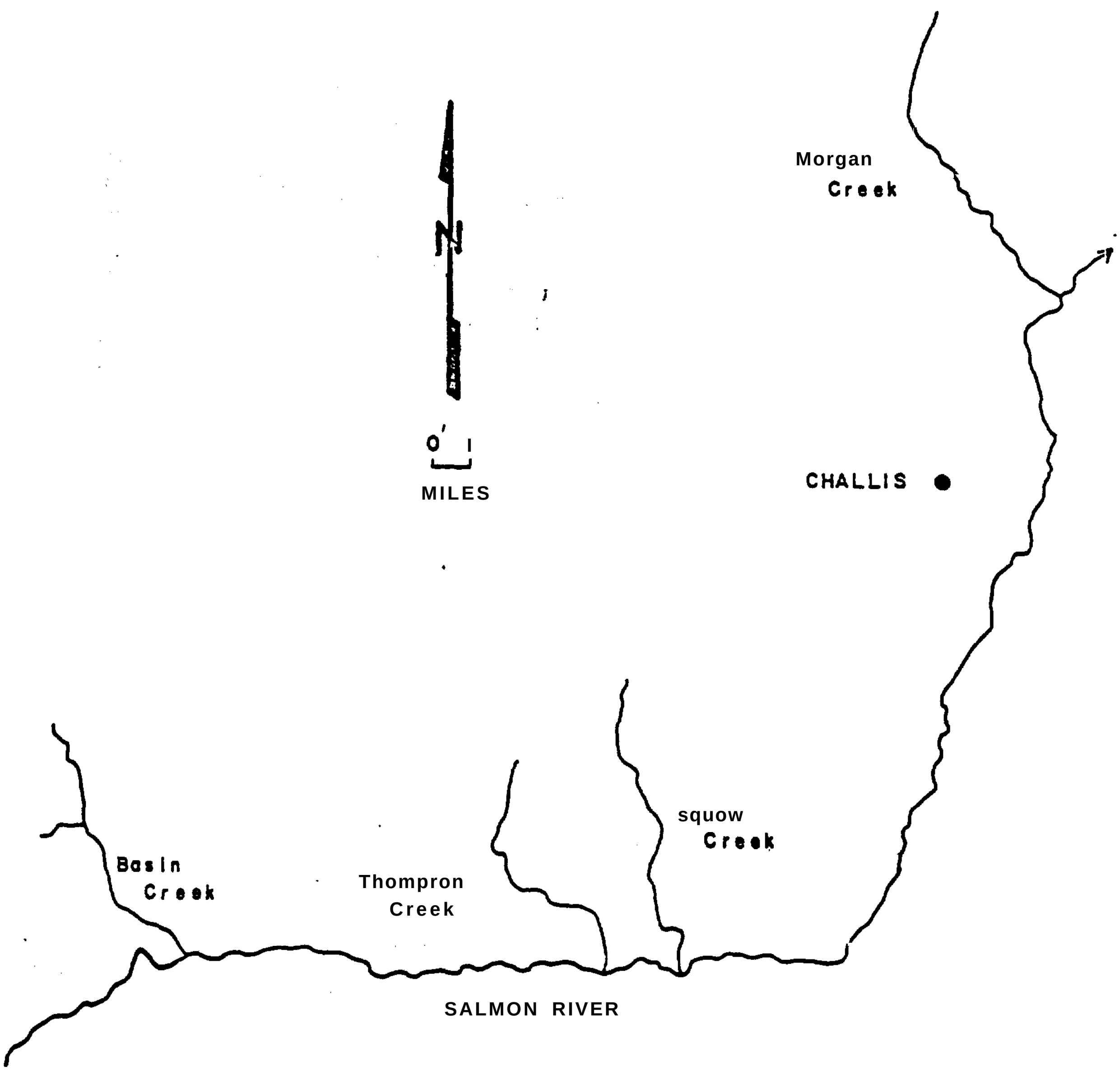


Figure 4. Lower portion of the Salmon River and its tributaries. (Challis Not lonal Forest)



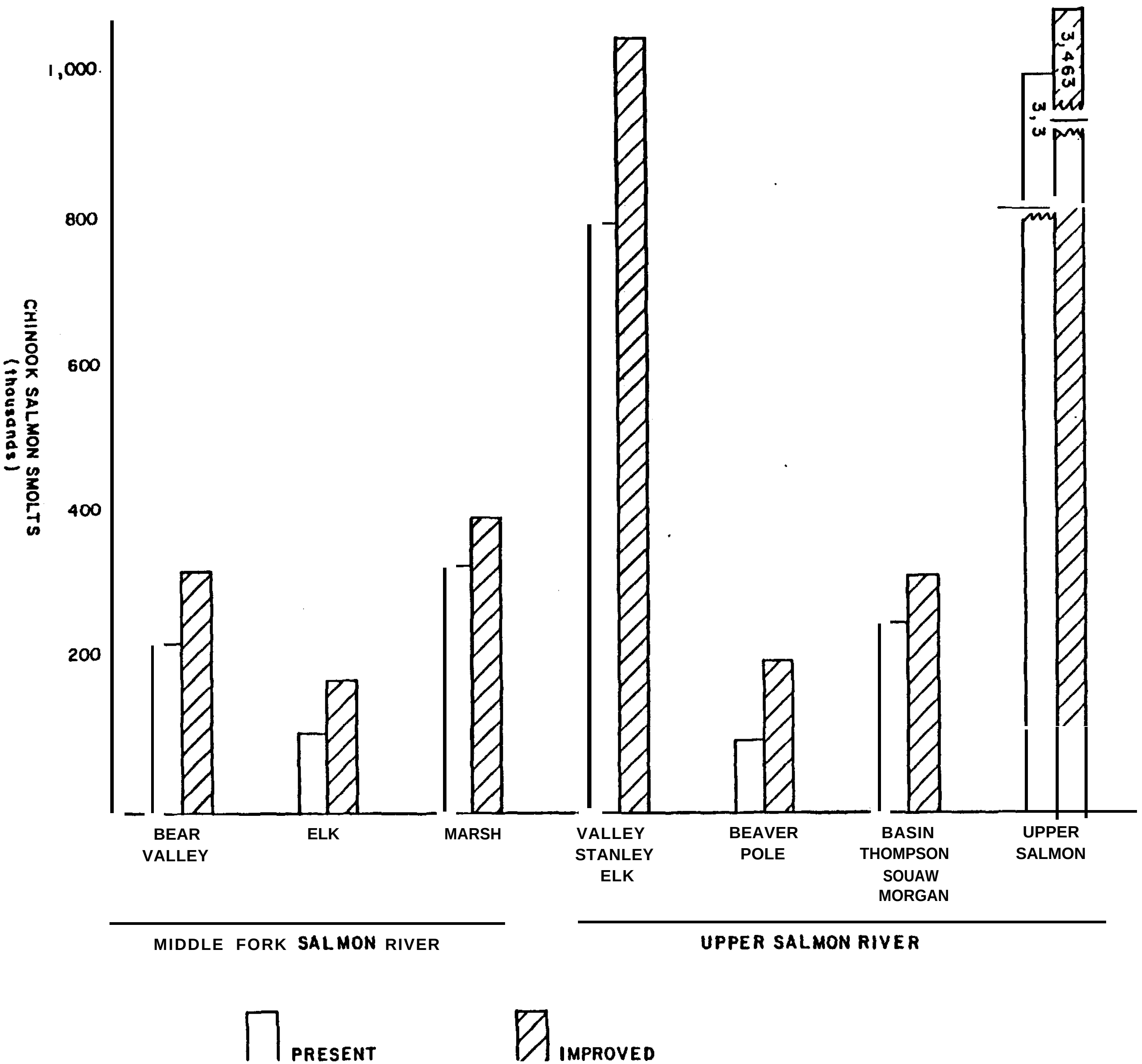


Figure 5 resent potential and improved potential for Chinook Salmon production.

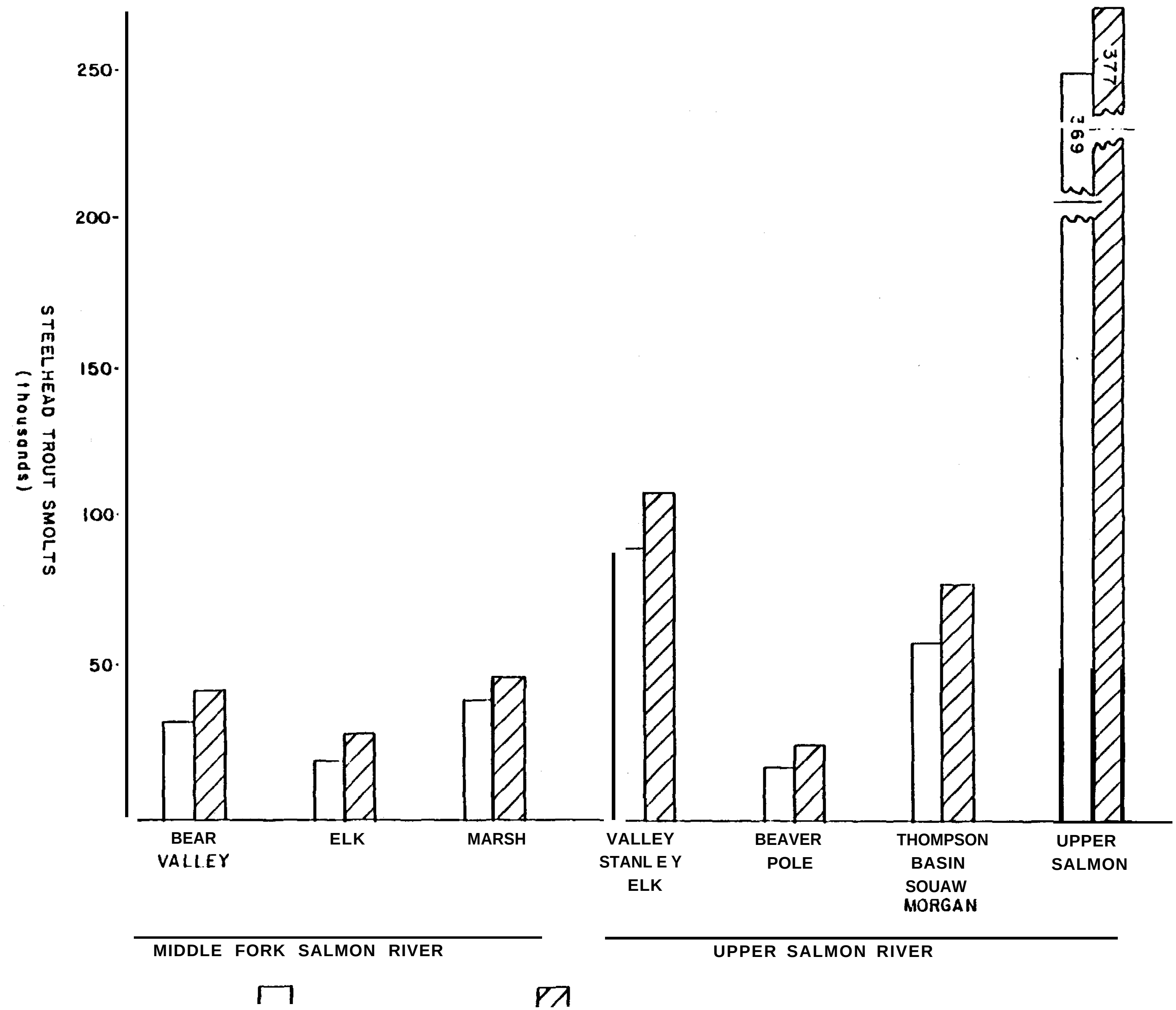
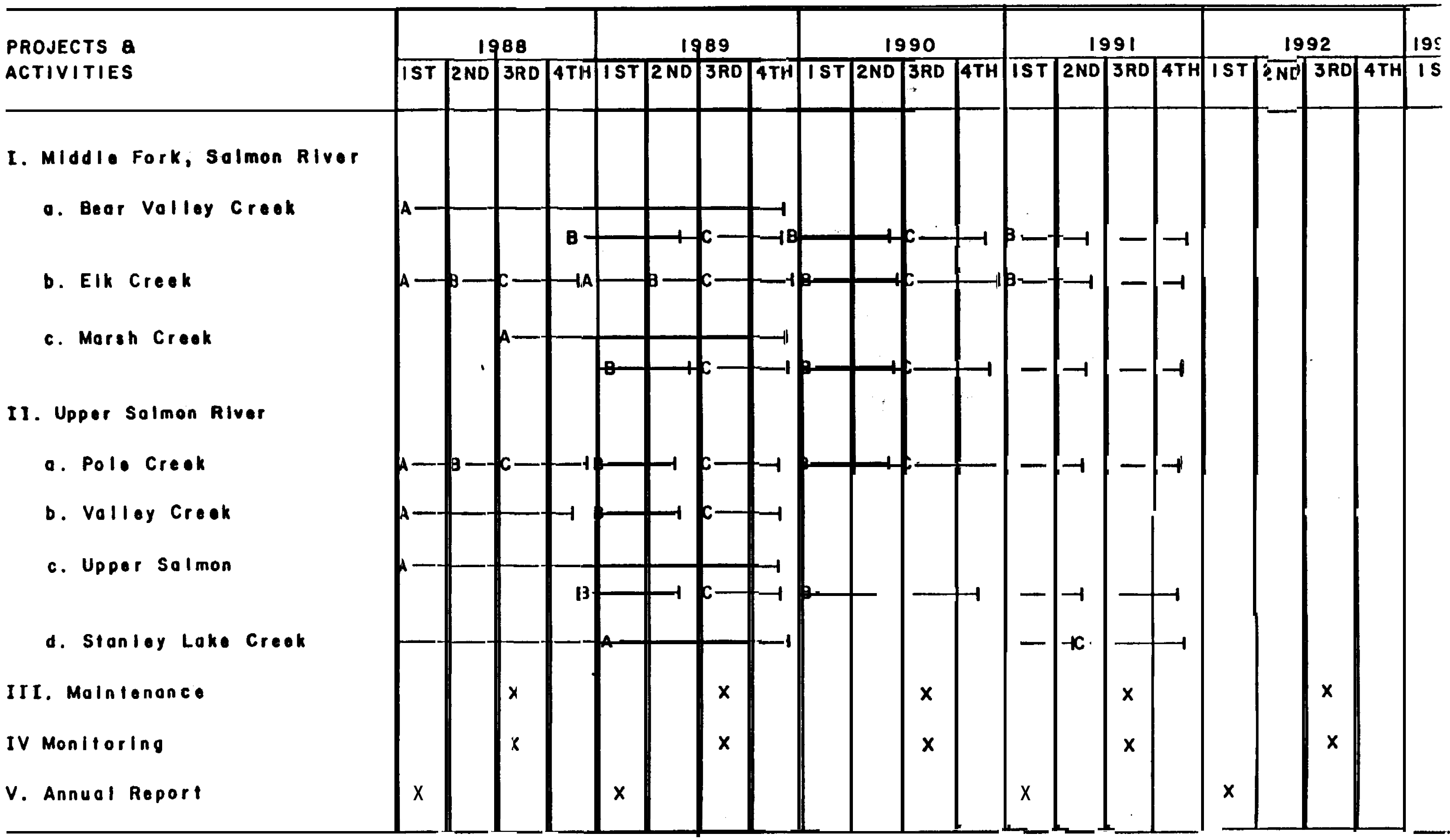
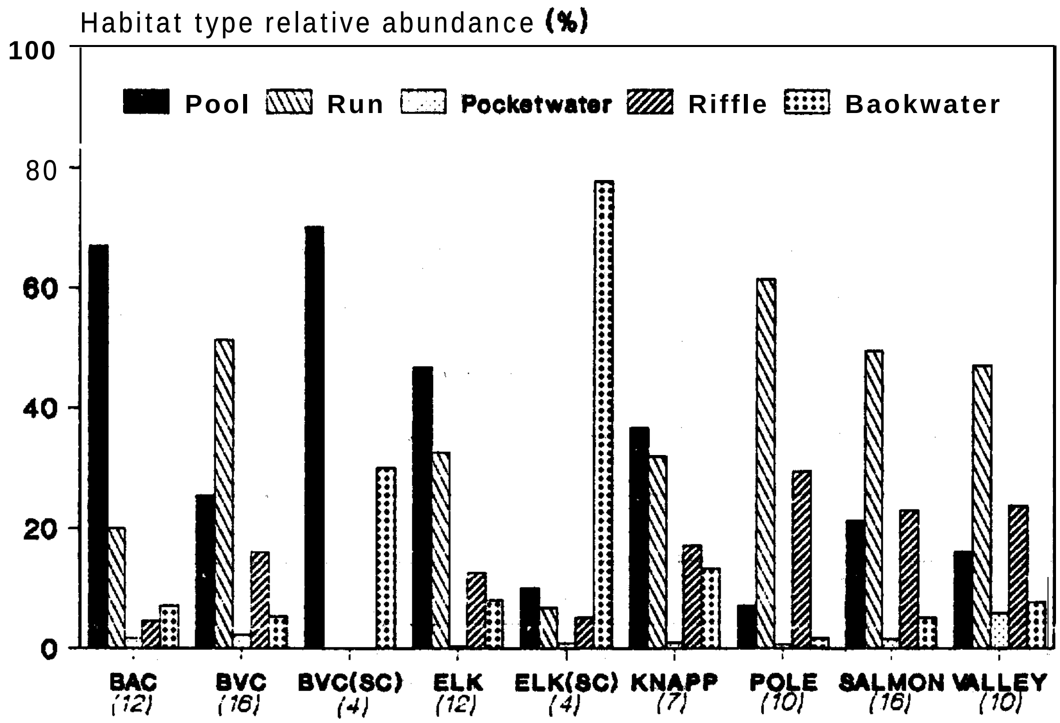


Figure 6. PRESENT POTENTIAL AND IMPROVED POTENTIAL FOR STEELHEAD TROUT PRODUCTION

Figure 7. IMPLEMENTATION SCHEDULE FOR MIDDLE FORK & UPPER SALMON RIVER SUBBASINS HABITAT & PASSAGE IMPROVEMENTS PROJECTS.



A = PROJECT DESIGN   B = CONTRACT PREPARATION & AWARD   C = CONTRACT ADMINISTRATION



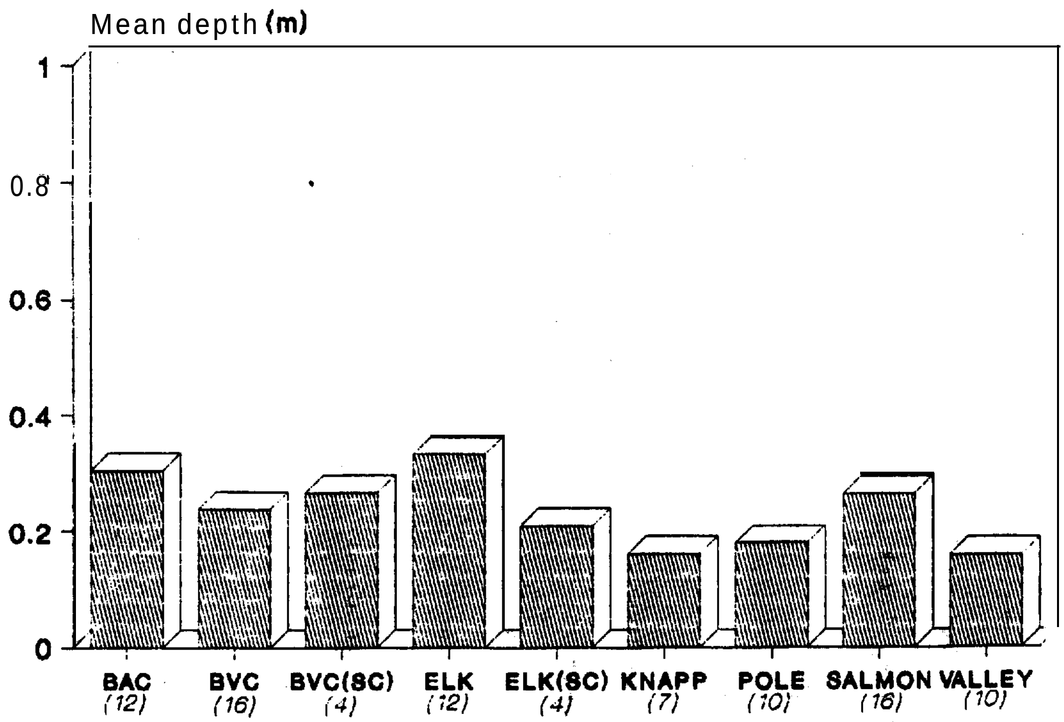


Figure 8. Mean habitat type relative abundance (top) and depth (bottom) for seven streams in Salmon River drainage. BAC and BVC stand for Bearskin and Bear Valley Creeks, respectively. Numbers in parentheses indicate the number of transect sections surveyed in 1988. Each transect section had ten transects with three measurements per transect.

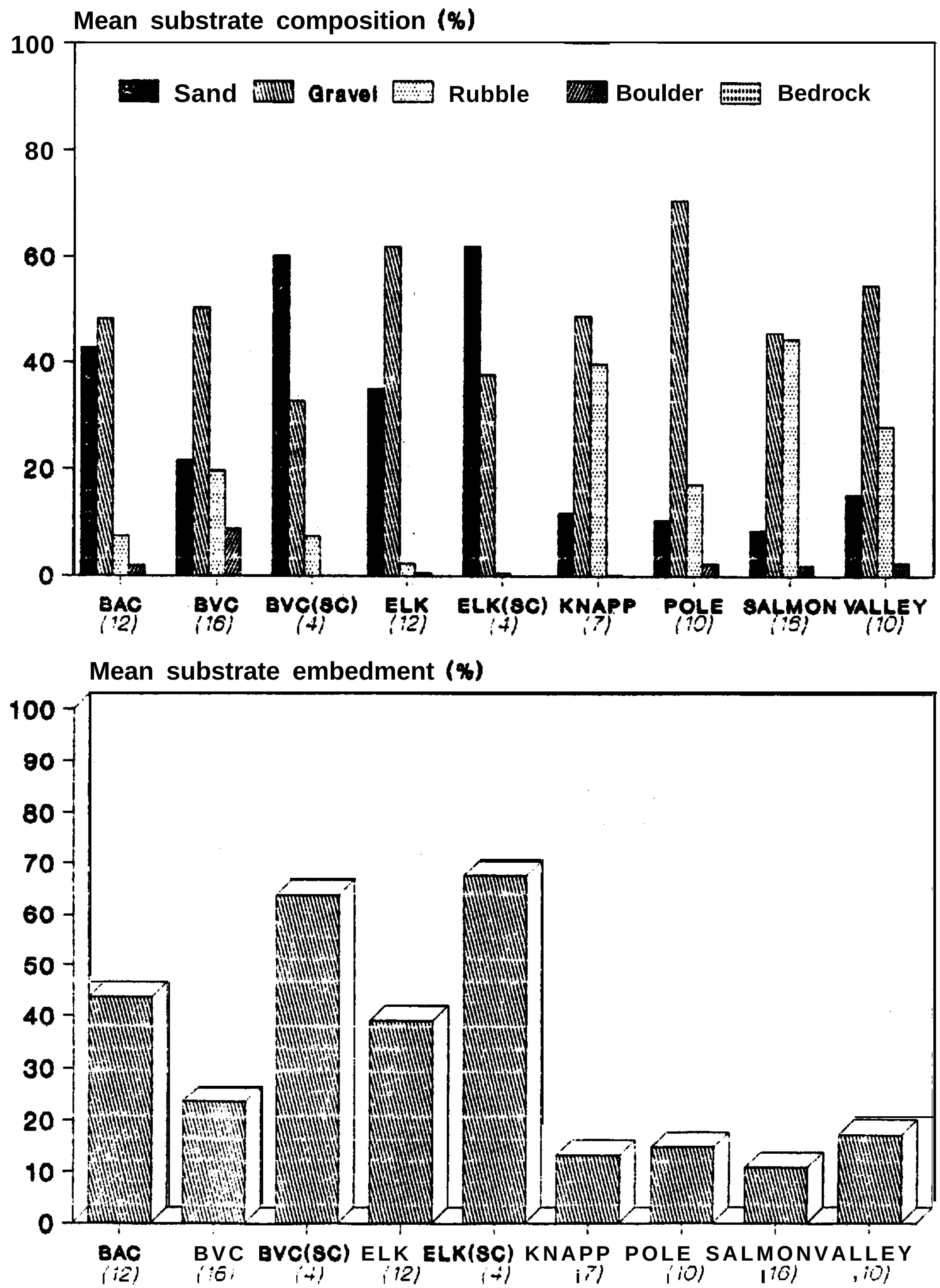


Figure 9. Mean substrate composition (top) and embedment (bottom) for seven streams in the Salmon River drainage. BAC and BVC stand for Bearskin and Bear Valley Creeks, respectively. SC indicates side channel. Numbers in parentheses indicate the number of transect sections surveyed in 1988. Each section had ten transects with three measurements per transect.

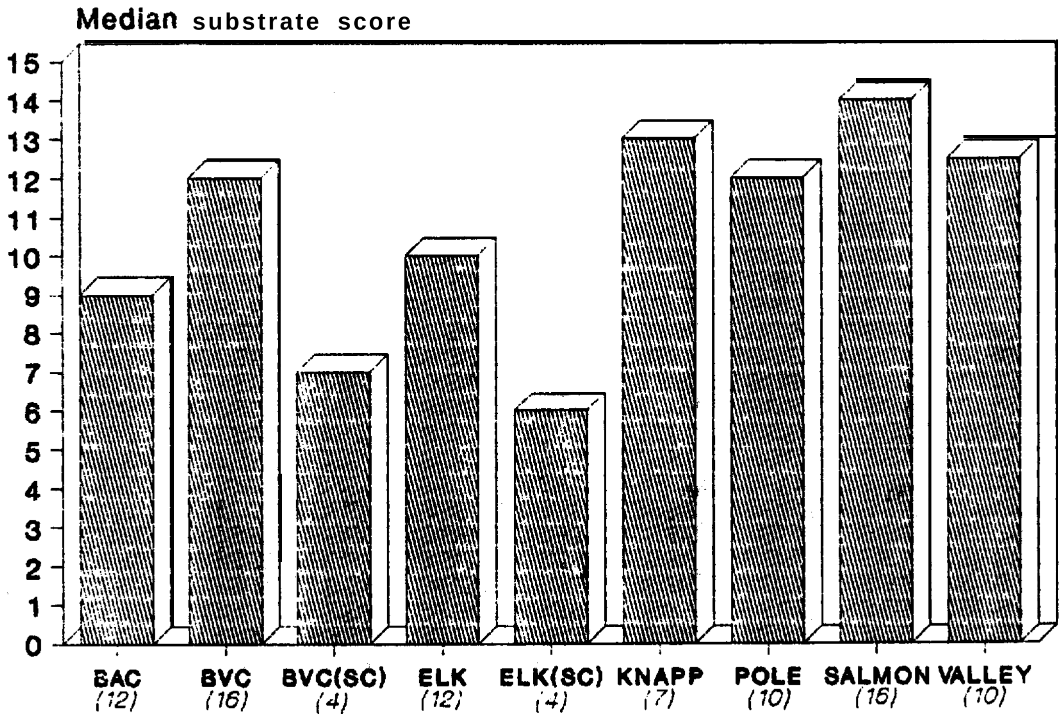


Figure 10. Median substrate score for Salmon River drainage. BAC and BVC stand for Bearskin and Bear Valley Creeks, respectively. SC indicates side channel. Numbers in parentheses indicate the number of transect sections surveyed in 1988. Each section had ten transects with three measurements per transect.

Appendix B: Tables 1 ts 5

Table 1. Spring and summer chinook annual smolt production potential in the project area based on low flow rearing area (source: see footnote 1).

DRAINAGE	MILES	AREA (M^2)	HAB. QUAL.	PRESENT DENSITY (SMOLTS PER M^2)	PRESENT POTENTIAL REARING CAPACITY	ESTIMATED POTENTIAL REARING WITH IMPROVEMENTS	ESTIMATED SMOLT INCREASE
Middle Fork Salmon							
Bear Valley	15.7	227,000	Good	0.64	143,000	175,000	32,000
	17.0	231,000	Fair	0.37	85,000	148,000	63,000
	0.6	6,000	Poor	0.10	1,000	2,000	1,000
Elk	9.8	89,000	Good	0.64	57,000	69,000	12,000
	17.4	132,000	Fair	0.37	49,000	84.000	35,000
	5.9	47,000	Poor	0.10	5,000	13:000	12,000
Marsh	4.5	66,000	Excel	0.90	60,000	60,000	0
	65.3	428,000	Good	0.64	274,000	330,000	56,000
Subtotals	136.2	1,226,000			674,000	881,000	211,000
Upper Salmon							
Upper Salmon R.	16.5	493,000	Excel	0.90	444,000	444,000	0
and smaller	52.7	3.903,000	Fair	0.37			
tributaries	4.4	65,000	Poor	0.10	6,000	24,000	18,000
Valley Cr.	22.9	938,000	Good	0.64	600,000	722,000	122,000
Stanley Cr.	5.6	48,000	Fair	0.37	18,000	31,000	13,000
Elk Cr.	11.6	280,000	Good	0.64	179,000	216,000	371000
Pole Cr.	9.0	232,000	Fair	0.37	86,000	148,000	62,000
Beaver Cr.	4.0	129,000	Poor	0.10	13,000	48,000	35,000
Basin Cr.	6.8	163,000	Good	0.64	105,000	126,000	21,000
	5.5	134,000	Fair	0.37	49,000	86,000	37,000
Thompson Cr.	7.5	97,000	Good	0.64	62,000	74,000	12,000
	5.0	64.000	Fair	0.37	24,000	41,000	17,000
Squaw Cr.	2.0	15:000	Fair	0.37	5.000	10,000	5,000
	5.8	43.000	Poor	0.10	4.000	16,000	12,000
Morgan Cr.	10.0	85,000	Poor	0.0	0	9,000	9,000
Subtotals	199.8	9,618,000			4,532,000	4,990,000	458,000
Totals	336.0	10,844,000			5,206,000	5,871,000	669,000

1/ The data in tables 1 and 2 was prepared from preliminary data being developed for the Columbia Basin System Plan by the Northwest Power Planning Council. These tables will be updated when the Salmon Subbasin Plan is finalized. Monitoring will further adjust the data in these tables.

2/ Rearing area only.

Table 2. Summer Steelhead annual smolt production potential in the project area based on low flow rearing area (source: see footnote 1).

DRAINAGE	MILES	AREA (M^2)	HAB. QUAL.	PRESENT DENSITY (SMOLTS PER M^2)	PRESENT POTENTIAL REARING CAPACITY	ESTIMATED POTENTIAL REARING WITH IMPROVEMENTS	ESTIMATED SMOLT INCREASE
Middle Fork Salmon							
Bear Valley	29.8	275,000	Good	0.07	19,000	23,000	4,000
	8.1	62,000	Fair	0.05	3,000	4,000	1,000
	15.3	261,000	Poor	0.03	8,000	13,000	5,000
Elk Creek	8.7	78,000	Good	0.07	5.000	7.000	2,000
	25.7	186,000	Fair	0.05	9,000	14,000	5.000
	7.7	57,000	Poor	0.03	2,000	3,000	1,000
Marsh Creek	4.5	66.000	Excel	0.10	7,000	7,000	0
	65.3	428,000	Good	0.07	30,000	36,000	6,000
Subtotals	165.1	1,413,000			83,000	107,000	24,000
Upper Salmon							
Upper Salmon R.	69.2	4,396,000	Good	0.07	308,000	315,000	7,000
and smaller	31.1	2,929,000	Fair	0.02 2/	59,000	59,000	0
tributaries	4.4	65,000	Poor	0.03	2,000	3,000	1,000
Valley Cr.	22.9	938,000	Good	0.07	66,000	80,000	14,000
Stanley Cr.	5.0	48.000	Fair	0.05	2,000	3,000	1,000
Elk Cr.	11.6	280:000	Good	0.07	20,000	24,000	4,000
Pole Cr.	9.0	232,000	Fair	0.05	12,000	16,000	4,000
Beaver Cr.	4.0	129,000	Poor	0.03	4,000	6,000	2,000
Basin Cr.	6.8	190,000	Good	0.07	13,000	16,000	3,000
	5.5	106,000	Fair	0.05	5,000	7,000	2,000
Thompson Cr.	7.5	101,000	Good		7,000	9,000	2,000
	5.0	60,000	Fair	0.07	3,000	4,000	1,000
Squaw Cr.	9.8	219,000	Good	0.07	15,000	19,000	4,000
	6.6	108,000	Fair		5,000	8,000	3,000
Morgan Cr.	10.35	88,000	Good	0.07	6,000	7,000	1,000
	10.35	88,000	Fair	0.05	4,000	6,000	2,000
Subtotals	219.1	9,977,000			531,000	582,000	51,000
Totals	384.2	11,390,000			614,000	689,000	75,000

1/ The data in tables 1 and 2 was prepared from preliminary data being developed for the Columbia Basin System Plan by the Northwest Power Planning Council. These tables will be updated when the Salmon Subbasin Plan is finalized. Monitoring will further adjust the data in these tables.

Table 3. Project'costs, April 1988 to February 1989.

BPA Funds: 1/

Salaries		$122,000
Transportation and travel		30,000
Training		1,000
Expendable Equipment		8,000
Nonexpendable and sensitive items 1/		15,000
Equipment rental contracts		180,000
	Total	**$356,000**

Forest Service Appropriated Funds:2/

Salaries		$8,200
Contracting, and fiscal services		9,000
Materials and supplies		1,000
Equipment rental contracts		$10,900
	Total	**$28,000**

1/ Sensitive items were purchased during the contract year ending March 31,1989 were a dell computer'system with printer and associated software.

3/ Forest Service Cost Sharing with BPA Project No. 84-24 during 1987: Boise, Challis, and Sawtooth National Forest and Inter-mountain Region employees assisted the project leader with implementation planning, contract preparation and administration, and fiscal management.

Table 4. A summary of the project budgets for FY 1989-1992

Sub-Projects	m-89,	FY-90	FY-91	FY-92
PHASE I				
Project leader	61,621	63,427	65.347	67,378
PHASE11				
I. Middle Fork Salmon River				
a. Bear Valley Creek (Bear Valley Creek Portion)				
1. Design	5,000			
2. Implementation	40,000	30,000	20,000	DONE
Subtotals	45,000	30,000	20,000	DONE
b. Elk Creek				
1. Design	30,000			
2. Implementation	34,003	25,000	10,000	DONE
Subtotals		25,000	10,000	DONE
c. Marsh Creek				
1. Design	3,000	DONE	DONE	
2. 'Implementation	10,000	15,000	10,000	DONE
Subtotals	13,000	15,000	10,000	DONE
II. Upper Salmon River and Tributaries Anadromous Fish Habitat Improvement				
a. Pole and Valley Projects				
1. Design	3,000			
2. Implementation	30,000	30,000	30,000	DONE
Subtotals	35,000	30,000	30,000	DONE
b. Upper Salmon River and Tributaries				
1. Design		14,000	4,000	DONE
2. Implementation	40,000	70,000	go , 000	DONE
Subtotals	54,000	74,000	90,000	DONE
III. Physical Monitoring	50,049	51,065	52,081	51,968
IV. Project Maintenance	10,000	15,000	15,000	5,000
PHASE I &II GRANDTOTALS	300,670	303,492	302,428	124,346

Table 5. Stream miles evaluated and number of transect sections measured July - October 1988 in three Salmon River subbasins.

Subbasin Stream	Stream miles evaluated	Transect sections
Middle Fork Salmon River		
Ayers Creek	1.3	
Bear Valley Creek	12.6	20
Bearskin Creek	6.8	12
Boulder Creek		
Elk Creek	0.9	16
Cold Creek	0.7	
Cook Creek	2.0	
Fir Creek	6.2	
Knapp Creek	6.0	7
Pole Creek	0.2	
Wyoming Creek	1.4	
South Fork Salmon River		
Johnson Creek	9.0	
Upper Salmon River		
Pole Creek	7.5	10
Salmon River	8.4	16
Valley Creek	9.0	10
	72.0	91